Editorial

Challenges in Nutritional Neuroscience

Good nutrition is essential for fitness and overall health. But how does diet translate into mental health? The present collection of scientific reports and reviews focuses on identifying key mechanisms by which food may act on the brain. While it has long been known that serious deficiencies in micronutrients can induce neuronal damage, optimized nutrition for the brain requires a much more detailed understanding of the neuronal footprint of our diet. There is now an urgent need for collaborative efforts in this field to intensify research and to meet the challenge posed by brain disorders to our society. By 2020, ill mental health is anticipated to rise to the third most significant health burden worldwide [1]. As poor mental health also contributes to the development of physical health inequalities and illnesses, the top ranked burdens heart disease and perinatal conditions will likely be aggrevated.

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A changing panorama of disease is not the only reason to address central nervous system (CNS) effects of specific food constituents. Over the past decades, dietary habits have evolved rapidly with a trend towards food supplementation and fortification. Today, 95% of caffeine in most soft drinks is added by manufacturers to promote arousal, as opposed to a minor amount originating from cola nuts. Dietary constituents and supplements are leading to a shift in the intake of many other compounds for which brain functionalities are advertised but remain poorly defined. They reflect an increasing demand for strategies that may help to enhance cognitive performance in our daily lives, in addition to agents that confer long-term protection against the effects of aging. Unsaturated fats, caffeine and antioxidants count among the dietary compounds that are being marketed as nootropics for such short-term benefits to brain functioning in healthy users. Systematic evaluations of these claims calls for a multilevel approach.

While basic science can help assess an adverse or beneficial impact of candidate substances on neuroplasticity, cellular signaling, and on specific behavioral measures, many caveats apply to extrapolations of these findings. The complex composition of food may dramatically alter both the bioavailability and the bioactivity of compounds *in vivo*. Successful analysis of behavioral outcome in animal models is challenging due to complex and dynamic interactions among behavior, environment and nutrition. Experimental dietary manipulations may result in brain structural and functional effects that trigger neurohormonal feedback and affect food intake. From cellular and animal models of brain function, to nutritional epidemiology and the clinical trial level, this special issue covers the entire spectrum of methodologies in nutritional neuroscience. Many of the findings presented lend themselves to further study in the prevention of chronic illnesses including cognitive and mood disorders, and some may hold promise in developing adjuncts to already established forms of treatment. I am grateful to all contributors for paving the way forward, and to the Editor-in-Chief for providing this forum for distinguished authors from around the world.

[1] Global Forum for Health.

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